

Possible Effects of Eutrophication and Habitat Alteration on an Endangered Species and Implementation of Dissolved Oxygen Data

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Estuarine eutrophication, hypoxia, habitat alteration, and endangered species are concerns for the U.S. Environmental Protection Agency (U.S. EPA), other federal and state resource agencies, and the public. Eutrophication can be a primary factor in causing lowered dissolved oxygen (DO) concentrations; water containing ≤ 2 mg dissolved oxygen/L is considered hypoxic, whereas water containing no dissolved oxygen is anoxic. Habitat alterations can also have negative impacts on DO concentrations, which in turn can adversely impact the fauna, especially the more sensitive species. Flow-through acute tests were conducted with hatchery-produced, endangered shortnose sturgeon, *Acipenser brevirostrum*, exposed to ranges of DO, salinity, and temperature representative of southeastern coastal rivers and estuaries during spring and summer. The exposure apparatus was unique and first described in our publication. We collaborated with the U.S. Fish and Wildlife Service to obtain sturgeon and with the National Marine Fisheries Service (NMFS) Office of Endangered Species to perform the research.

We found an increased sensitivity to low DO concentrations in these fish with increased temperatures. The 24-hour LC50 (estimated concentration lethal to 50% of the test organisms) derived with ≈ 77 -d-old fish tested at 2 o/oo salinity and a nominal 25 °C was 2.6 mg/ℓ. The test with ≈ 100 -d-old fish at 2 o/oo salinity and a nominal 30 °C yielded a 24-hour LC50 of 3.1 mg/ℓ. This is important as the higher temperatures coincide with summer months when the effects of the spring nutrient runoff from terrestrial-based sources could be near their peak. Because young-of-the-year shortnose sturgeon were especially sensitive to low DO, our results were important in deriving Ambient DO Criteria for Chesapeake Bay and Its Tidal Tributaries (developed by U.S. EPA Region III in coordination with the Office of Water). The results also were cited extensively in the U.S. EPA's biological evaluation of the Chesapeake Bay DO criteria and by the NMFS in their Endangered Species Act biological opinion on the criteria. The data also should prove valuable to states along the Atlantic seaboard in establishing total maximum daily loads and maintaining suitable habitat for extant shortnose sturgeon populations. At conclusion of the experiments, these often unobtainable fish were preserved and distributed among eight museums across the nation for inclusion in their ichthyological collections.